4.0 ALTERNATIVES ANALYSIS

4.1 Introduction

This section of the Gloucester Harbor DMMP DEIR presents the alternatives for the disposal or management of UDM as well as a comparative assessment of the environmental impacts of each alternative. Both state and federal laws guide the development of the alternatives analysis contained in this section of the DEIR. The two principal statutes are:

(1) Massachusetts Environmental Policy Act (MEPA), Massachusetts General Laws (MGL) Chapter 30, Sections 61 and 62A-H. MEPA is the environmental review statute of the Commonwealth, and is the law under which this DEIR is being prepared. MEPA provides an opportunity for public review of potential environmental impacts of projects for which state agency actions (e.g., permits, funding, or agency-sponsored projects) are required. Most important, MEPA functions as a vehicle to assist state agencies in using: "... all feasible means to avoid damage to the environment or, to the extent damage to the environment cannot be avoided, to minimize and mitigate damage to the environment to the maximum extent practicable." (MEPA, 1998)

MEPA requires an analysis of "reasonable alternatives and methods to avoid or minimize potential environmental impacts" (301 CMR 11.07(6)) and that all "feasible" alternatives be analyzed in an EIR. Feasible alternatives means those alternatives considered: "... in light of the objectives of the Proponent and the Mission of the Participating Agency, including relevant statutes, regulations, executive orders and other policy directives, and any applicable Federal, municipal, or regional plan formally adopted by an Agency or any Federal, municipal or regional governmental entity" (301 CMR 11.07(6)(f)).

(2) Clean Water Act (CWA), in particular the Section 404(b)(1) guidelines of the US Environmental Protection Agency (Title 40, Code of Federal Regulations (CFR), Part 230), require that "practicable" alternatives to a proposed discharge to waters of the United States be considered, including avoiding such discharges, and considering alternative aquatic sites that are potentially less damaging to the aquatic environment. The goal of the Section 404(b)(1) guidelines is to provide a framework for arriving at the Least Environmentally Damaging Practicable Alternative (LEDPA). While the alternative selected for implementation needs to be the least environmentally damaging, i.e. resulting in the least amount of human and natural environment impact of the alternatives studied, it also needs to be practicable. The term "practicable" means "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes."

In consideration of the above, the alternatives for Gloucester Harbor included in this section of the DEIR are those alternatives for the disposal and/or reuse of UDM.

4.2 No Action Alternative

Consideration of the No Action Alternative for the Gloucester Harbor DMMP is required under the MEPA Regulations at 301 CMR 11.07(6)(f). The No Action alternative is used to provide a future baseline against which the impact of the Preferred Alternative(s) is (are) measured, compared and contrasted. It is representative of future conditions in Gloucester Harbor, without the changes or activities that would result from the implementation of the Preferred Alternative(s) for disposal of UDM.

The No Action alternative assumes that dredging activities involving the removal of sediments that are unsuitable for unconfined open water disposal would not occur. It is estimated that approximately 330,000 cy of sediment to be dredged from Gloucester Harbor over the next 20 years is unsuitable for unconfined open water disposal. Therefore, under the No Action alternative, this 330,000 cy of sediment would not be dredged.

Existing sedimentation rates in Gloucester Harbor would continue unabated and the navigation channels would slowly fill in. The USACE estimates that the federal navigation channels in Gloucester receive a net volume of 2,200 cy of sediment per year, which equates to approximately 0.25 inches within the channels. The approximately 50 dredging projects and activities which have been identified to continue economic growth in the City of Gloucester in their Harbor Plan would not occur. Specifically, for the Gloucester Harbor DMMP, no aquatic or upland disposal sites for UDM would be constructed and future environmental impacts which would result from their construction and use would be avoided.

4.3 Description of Disposal Alternatives

4.3.1 Aquatic Disposal Alternatives

The following describes several types of aquatic disposal methods considered for the disposal of dredged material. Generally speaking, the primary advantages of open water disposal over other disposal alternatives are typically the large disposal capacity, relatively short-term environmental impacts, and lower relative cost (Carey et al., 1999). The primary disadvantages of aquatic disposal include potential changes in benthic habitat quality and temporary water quality degradation, as well as complex logistics associated with certain types of aquatic disposal. The complexity of aquatic disposal is due to the interdependence, sequencing and timing of dredging, storage and disposal operations.

4.3.1.1 Confined Aquatic Disposal

Confined aquatic disposal (CAD) is the process where dredged material that is unsuitable for unconfined open water disposal is deposited into the marine environment within a confined area, and then covered with suitable material (Figure 4-1). There are basically two methods of constructing a CAD site. Most commonly, CAD sites are created by placing unsuitable material on the existing seabed, and then covering it with clean dredged material which is considered suitable for open-water disposal. The overlying layer is commonly referred to as a cap, typically constructed using either dredged silt or sand. This method has been used in open-water disposal sites in New England (e.g., DAMOS 1994), New York (SAIC 1998), and elsewhere, and requires that sufficient suitable material be available to provide complete capping of UDM. In exposed

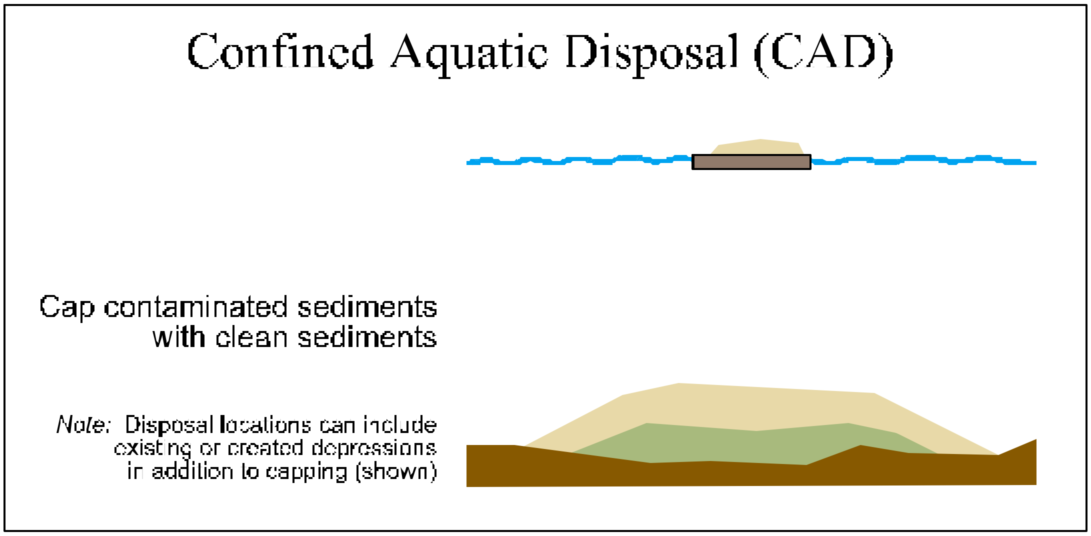


Figure 4-1. Schematic of Confined Aquatic Disposal (CAD) Mound Method

offshore regions in Massachusetts Bay, sites with topography conducive to confinement were preferred, in water depths of at least 65.6 feet (20 meters) to maximize protection against storm-driven waves.

The second method of constructing a CAD site is to excavate a confined area, or pit, which is then filled with UDM and capped. In general, these sites can be created in shallower water, but require water depths in excess of 20 feet (6.1 m), so that dredges and barges which are used to create the pit can access the area. Two types of CAD pits are presented for possible use:

Overdredge (OD) - CAD sites located within an existing channel that are dredged below the proposed navigational depth, then filled with dredged material and capped to the proposed navigational depth (Figure 4-2);

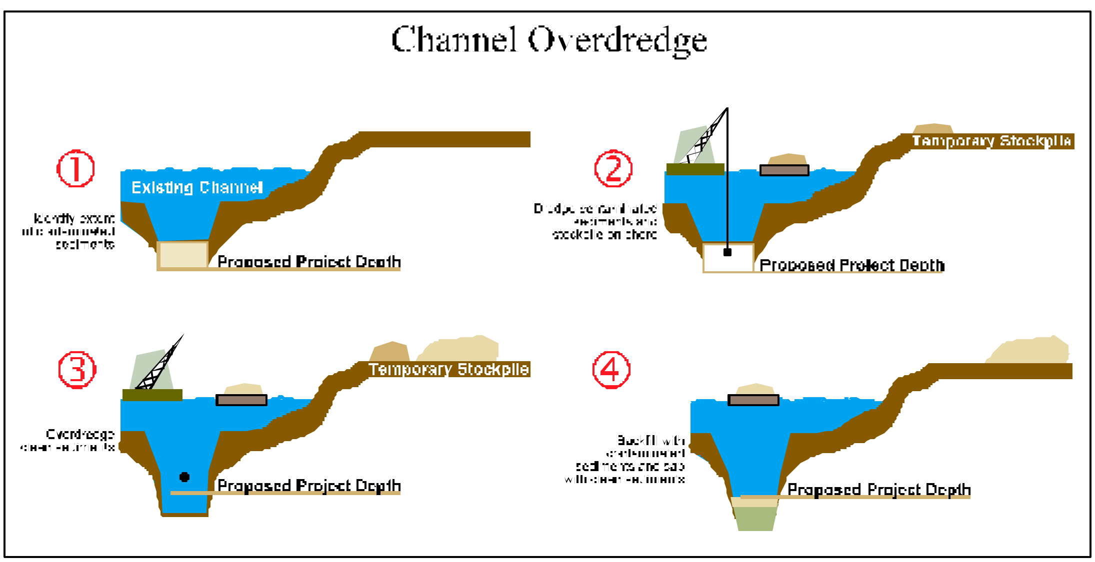


Figure 4-2. Schematic of Channel Overdredge (OD) Method

Adjacent-to-Channel (ATC) - CAD sites that are created along-side existing channels and/or anchorage areas.

The **OD** method is presently being employed for the BHNIP (NAE and Massport 1995; DADOS 1999). In this method, the pits are excavated in the channel, and then filled and capped up to or below the existing maintenance depth. If the overlying sediments in the channel are unsuitable, these are first removed and stockpiled. Dredging then continues into underlying suitable sediments, creating a pit below the designed channel depth. Suitable material is disposed of in an approved offshore disposal site (e.g. MBDS). UDM (including the stockpiled channel cover) is then deposited in the pit and covered with suitable material. In the BHNIP, the cap design was for three feet of sand, although alternative cap material can be considered. The selection of an appropriate cap material is dependent upon the environmental objectives of the CAD design, as well as the geotechnical properties of the sediment to be capped.

The **ATC** method is similar to the OD method, except that the pits are excavated in areas near, but outside, the project dredging area. The ATC can be dredged into existing bottom, but is limited only by the existing water depth rather than the maintenance depth of the channel. As with OD sites, if the overlying sediments prove to be unsuitable, the removed material also needs to be stockpiled for eventual deposition into the ATC pit.

The OD and ATC CAD alternatives have the advantages of locating the disposal site near an existing dredged area (the channel), causing only temporary disturbance of the bottom resulting in rapid biological recovery of the sea floor, and disposing of the material in an inner harbor area that is already impacted by human activity. When the OD site is located near the area being dredged, the additional advantages include (NAE and Massport 1995):

1) confinement of the disposal impacts to areas impacted by dredging;
2) sequestering the material near the point of origin; and,
3) compartmentalizing dredging and disposal operations.

Relative to the first type of CAD site in which no pre-dredging is required, the OD and ATC methods have the disadvantages of requiring additional dredging, longer project duration, greater material handling, larger disposal volumes (the material removed to create the pits), and increased costs. In addition, for OD sites, if the top-of-cap elevation is set as the channel depth, this method precludes future dredging of the channel to deeper design depths without first removing the previously deposited contaminated sediments. Where future navigational improvement projects are being contemplated, the OD top-of-cap elevation must include an adequate depth contingency to accommodate additional channel depth associated with planned future navigational improvement projects. One advantage of the ATC design is that there is no concern that the material will be disturbed by future maintenance dredging of existing navigational dredging projects.

4.3.1.2 Confined Disposal Facility

UDM may also be disposed in confined disposal facilities (CDFs), illustrated in Figure 4-3. Creation of a CDF requires construction of confinement walls, typically steel sheet pile, or a confinement berm of earth or stone. Stone reinforcement (rip-rap) may be required on the seaward side of confinement walls and berms to protect them from wave action and tidal scouring. An impermeable liner and cap may also be required, depending on the chemical characteristics of the dredged material. The liner and cap may be made of impermeable soils, such as clay, synthetic materials such as high density polyethylene (HDPE), or some combination of these two. Leachate collection, treatment and disposal may be necessary for lined cells during the construction period to control rainwater infiltration until the cap can be placed over the cell. CDFs have the advantage of isolating UDM from the environment, while at the same time creating new land which can be put to constructive uses, such as port expansion, development, open space, parkland, or upland wildlife habitat. Alternatively, the CDF can be left as a subaqueous area, creating additional wetlands , as discussed in the section on Tidal Habitat, below. CDFs have the disadvantages of: permanently displacing existing tidal and subtidal habitat; being relatively expensive to construct; and, requiring periodic maintenance to ensure the long-term structural integrity of the CDF.

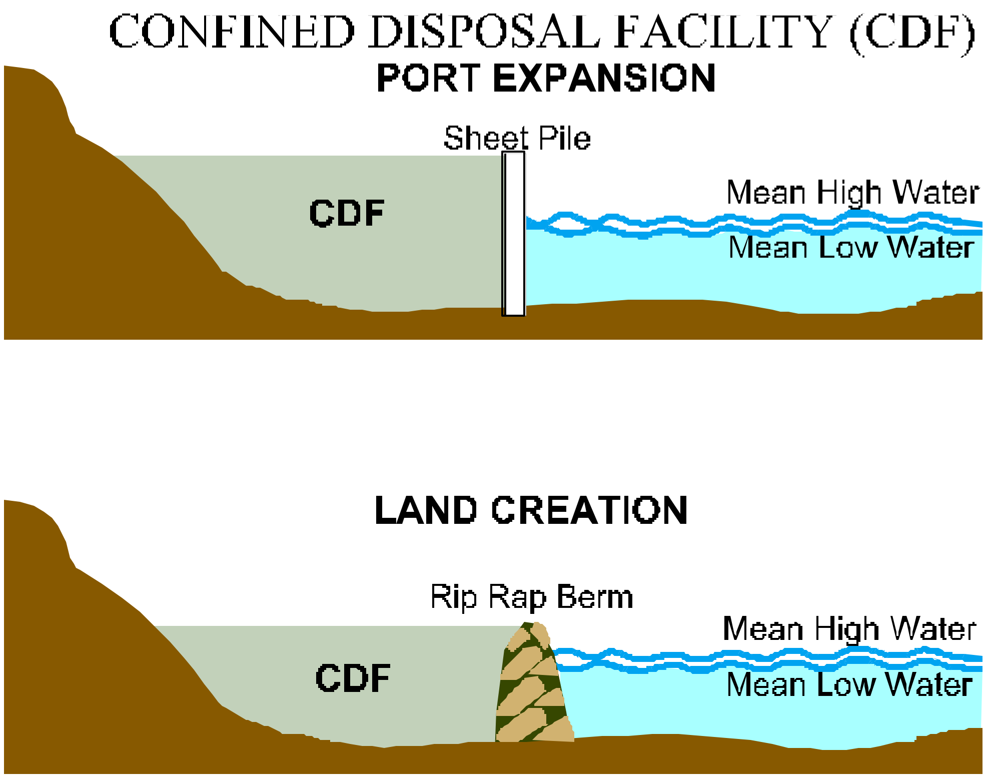


Figure 4-3: Schematic of the Confined Disposal Facility (CDF) Method

4.3.1.3 Tidal Habitat

A tidal habitat site is a special type of CDF, developed specifically for creation of tidal habitats such as mudflats and coastal wetlands (Figure 4-4). The tidal habitat method requires a cap of material that is chemically and physically able to support biological activity. The tidal habitat method requires creation of an impoundment to retain the dredged material and protect the newly created habitat from scouring currents and wave action. This is typically accomplished by building a berm or breakwater of stone, or of soil armored with stone, up to an elevation above high water. The berm would be penetrated by one or more culverts, enabling sea water to flow through the berm and equalize tide elevations on both sides. The area inside the berm can then be filled with dredged material. The surficial sediments that will be exposed to biological activity must be suitable material (similar to a CAD cap) in order to prevent bioaccumulation/biomagnification and bioturbation of contaminants.

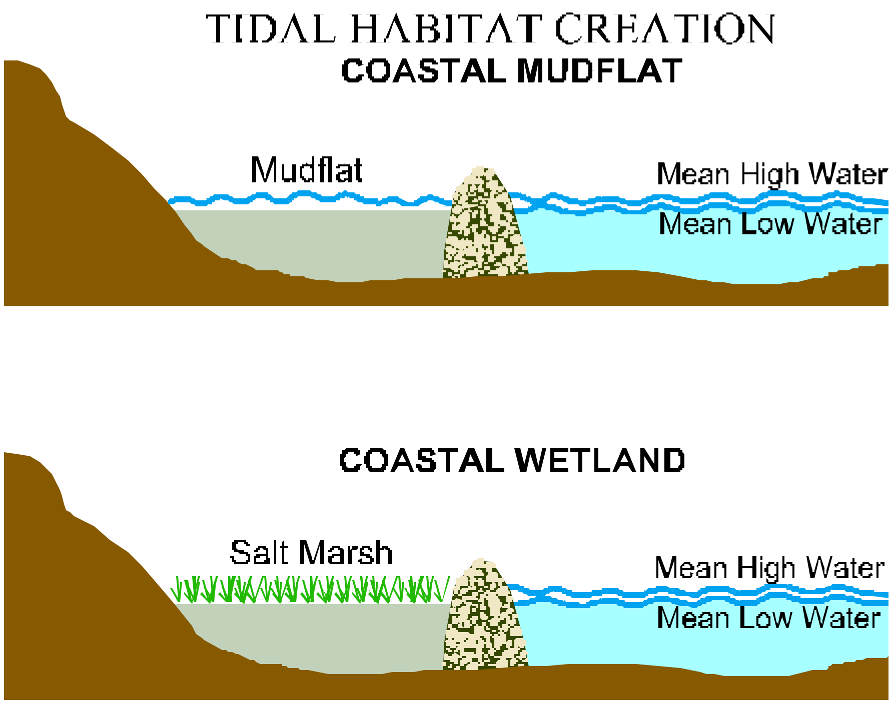


Figure 4-4: Schematic of the Tidal Habitat (TH) Creation Method

To create an intertidal mudflat, the area is filled to the elevation of mean sea level. This ensures that the surface will be covered with water at high tide and will be exposed at low tide. Tidal mudflats provide habitat for a wide range of invertebrate organisms, which, in turn, are an important source of food for shorebirds. To create tidal wetlands (i.e. salt marsh), the area is filled to an elevation that ensures that the surface will be flooded periodically, saturated most of the time, and exposed at low tide. Once the surface has stabilized, it is planted with species such as salt marsh cordgrass (*Spartina alterniflora*), salt meadow cordgrass (*Spartina patens*), and big cordgrass (*Spartina cynosuroides*). Salt marsh wetlands provide habitat for a wide range of invertebrate organisms, and are used as nurseries for many species of marine fish. These organisms are an important food source for shorebirds, waders and certain waterfowl.

Tidal habitat alternatives have the advantage of creating additional habitat in, or proximal to, densely developed urban areas (thereby restoring the functions and values of a natural coastline). They have the disadvantages of: displacing existing tidal and subtidal habitat; having low capacity relative to the total quantity of material to be dredged; being relatively expensive to construct; and requiring on-going monitoring and maintenance to ensure the integrity of confinement and the success of the created habitats.

4.3.2 Relationship of Alternative Treatment Technologies, Dewatering and Upland Disposal

Alternative treatment of marine sediment , dewatering and upland disposal are often components of a single logistical system for the handling/disposal of UDM. Depending on the characteristics of the sediment (its composition and mixture of contaminants), UDM must be handled, stored and transported several times before its ultimate disposal or reuse in the upland environment.

As illustrated in Figure 4-5, UDM first leaves the barge for storage, dewatering and/or treatment at a shore-side location. This location is referred to as a dewatering site. While at the dewatering site, the sediment will be placed in piles where the sediment will dry and the water will evaporate and run-off. This dewatering process may also be accelerated by use of mechanical devices such as a belt filter press. Sediment may be processed through a number of treatment methods to eliminate adverse impacts from contaminants. Treatment may be as simple as adding other substances to the sediment to solidify or chemically stabilize the dredged material. Treatment may also be quite complex involving incineration or a series of other processes which in themselves create environmental impacts. For upland disposal, a range of locations is possible: from active landfills to vacant parcels that may be converted to environmentally sound disposal sites for UDM. Each of these components of a non-aquatic disposal system have alternative choices within them. There are numerous types of alternative treatment technologies; several shore-side locations as potential dewatering sites and many locations as potential disposal sites for UDM. The following sections address alternatives within each of these non-aquatic disposal system components.

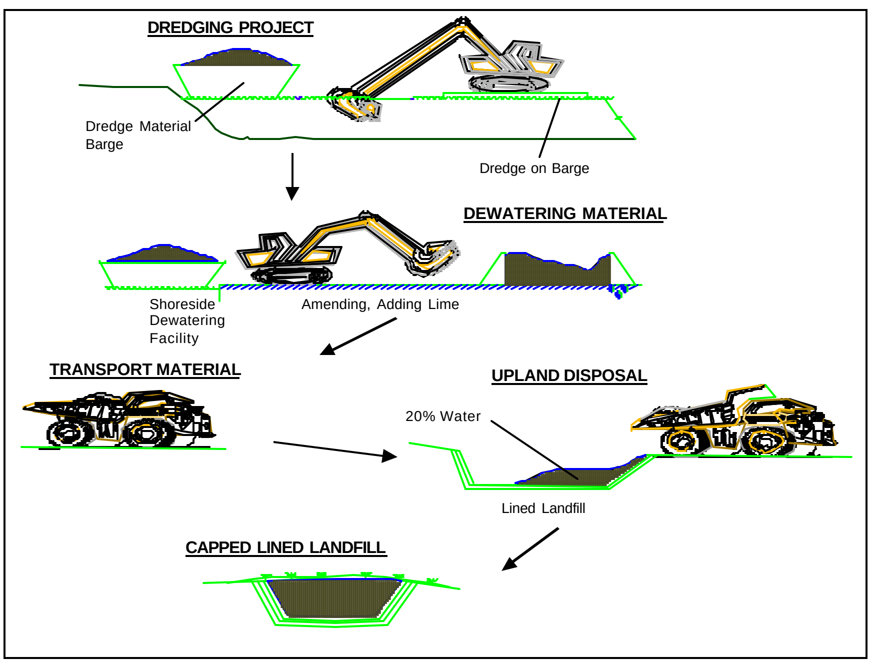


Figure 4-5: Upland Disposal Process

4.3.3 Alternative Treatment Technologies

Alternative treatment technologies involve the treatment of contaminated sediment, using one or more processes, to allow for reuse of the sediment in a safe manner in the upland environment or for unconfined open water disposal. There are four general types of treatment technologies, categorized based on their effect on the contaminants of concern within the sediment:

1) *Destruction*: the removal of contaminants from the sediment via physical, chemical or biological agents;

2) *Separation*: the process of removing contaminants from the sediment resulting in a concentrated residual of contaminated sediment of significantly smaller volume;

3) *Reduction*: the process of reducing the amount of contaminated dredged material that requires treatment by screening sediments into various particle sizes; and,

4) *Immobilization*: the fixing of contaminants in the dredged material which keeps the contaminants from being released to the environment.

Destructive methods are generally the most complex and expensive forms of treatment. Some of the destructive methods assessed in the DMMP include: incineration, pyrolysis, solvent extraction, thermal desorption and vitrification. The costs for such technologies range from $161-420/cy (Maguire Group Inc., 1997a).

Separation of contaminants from the sediment can be accomplished by solvent extraction and other techniques. These processes result in a residual material that requires disposal and/or further treatment. The average cost for solvent extraction is $182/cy (Maguire Group Inc., 1997a).

The primary method of reduction used today is soil washing, a process where water is used to separate the sediments by particle size into a reusable bulk fraction, and a smaller fraction containing concentrated contaminants. Because organic contaminants are often sorbed (adhered) to the finer sediment particles such as silts and clays, separation of this fine soil fraction from the coarser, sandy sediments allows for the reuse of the sand and an overall reduction in the volume of UDM. The average cost for this technology is $89/cy (Maguire Group Inc., 1997a).

Immobilization techniques evaluated in the DMMP include chelation and solidification/stabilization. Costs for such processes range from $75-$90/cy (Maguire Group Inc., 1997a). Some of these processes, such as solidification/stabilization, can produce a material with sufficient structural bearing strength to allow for use as structural fill in construction projects.

4.3.4 Dewatering Alternatives

In order to implement an upland disposal or alternative treatment option, a shore front site with adequate land area to dewater the dredged material is required. A dewatering site (or sites) is necessary to provide an area to reduce the moisture content of dredged material, allowing it to be processed and transferred to an upland disposal site for final disposal or reuse. The process to prepare dredged material for final upland disposal or reuse may involve one or more of the following site functions: off-loading (always required); material screening; lime treatment; soil amendment; and transfer to disposal/reuse site.

Off-loading of the dredged material requires that the barge be tied to a pier or seawall along the shore front. Front end loaders or cranes are used to unload the dredged material from the barge and place it on the site or in dump trucks which move the material to a specific location on the site. If the dredged material has a high water content, water-tight crane buckets and dump trucks may be required to minimize the uncontrolled discharge of sea water and suspended sediment into the water.

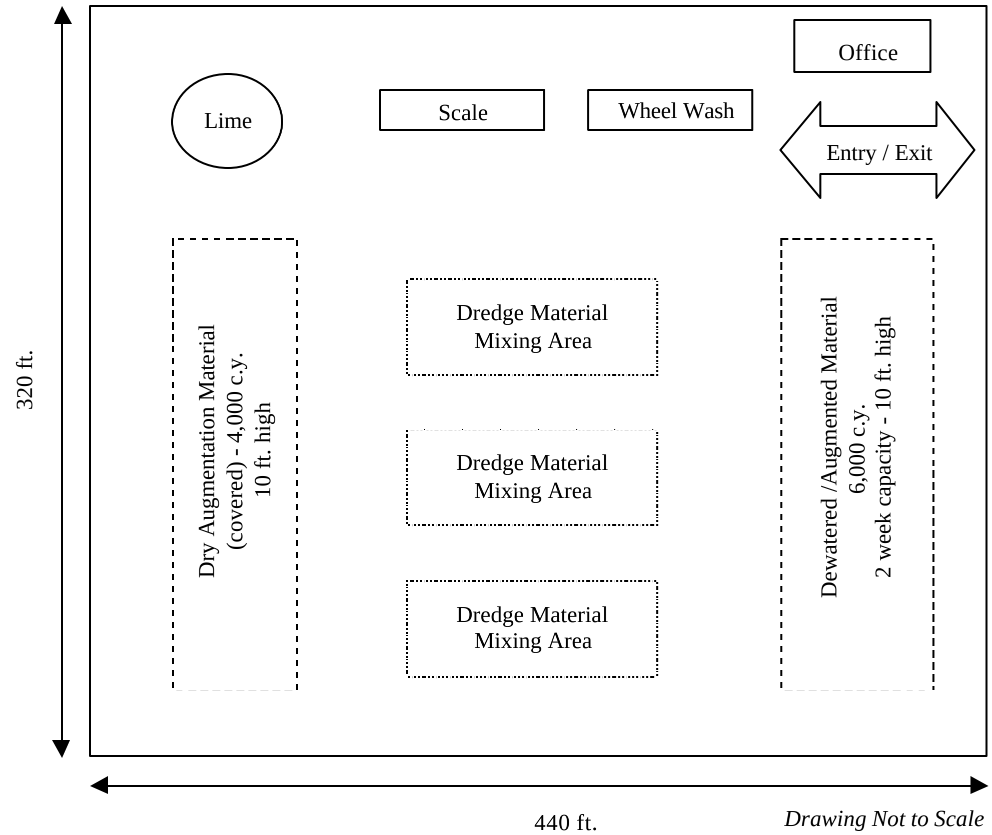
Material screening is often required to screen out large pieces of debris, such as piling fragments, fishing gear, and other debris typically encountered in an urban harbor environment. This material must be removed from the dredged material and disposed of separately.

Lime treatment is often required to reduce the moisture content of the dredged material and to control odors Anaerobic decomposition results in the production of a strong, sulfur odor that may be controlled via lime additions to the dredged material. Dredged sediment with a high organic content has often undergone long term anaerobic (without oxygen) decomposition in the marine environment. Lime treatment also reduces the moisture content of the dredged material, and results in a material which is easier to handle and spread.

Soil amendment of the dredged material is often required to produce a final product that is suitable for various end uses. UDM is typically a fine grained, silty material. Mixing or amending UDM with a coarser material such as sand improves the workability of the material. Depending on the water content and intended final use of the sediment, amendment of the dredged material may be required at the dewatering site before it is transported upland.

Transport of the dredged material to the final disposal or reuse site is required. Truck transport is the most common method. Water transport via barge or alternative land transport such as rail is also possible, but less common. Space must be available within the dewatering site to allow for loading of the transport vehicles.

Ideally, the performance of all the above functions are conducted at one dewatering site, minimizing the number of times the material is transported and reducing overall costs. To determine the minimum area required to process dredged material for upland/reuse disposal from a 10,000 cy dredging project, dewatering site logistics and area requirements were investigated for the DMMP. The site area requirements developed included the application of lime to control sulfide reactivity. Amendment of the material may also be done at the dewatering site. The typical dewatering site requires adequate area for mixing, lime storage, augmenting material storage, truck scale and wheel wash, and approximately a one week storage capacity for dewatered material.



Site Area Required:
Approximately 3.2 acres

Process:
UDM is mixed with augmentation material and a drying agent (quick lime etc.) to create workable material to be transported off-site for upland disposal/reuse.

Assumptions:
10,000 c.y. to be removed, 50 c.y./hr.dredge production rate, 10 hr. work day, 6 days/week based upon Central Artery Project CO9A8 contract dredge rate using similar augmentation process.

Advantages:
Short schedule
Workable material in short duration

Disadvantages:
Cost of augmenting material to workable consistency
Labor intensive, multiple re-handling.
Smell - hydrogen sulfide escaping material, spray with lime to control odor
Weather dependent.

Figure 4-6. DMMP dewatering site conceptual layout

Assuming a facility through-put capacity of 400 cy per day, based upon a typical workday (50 cy per hour times 8 hours per day), a 3.2 acre site (approximately 320-feet by 440-feet) is required. Figure 4-6 illustrates a conceptual site layout and requirements for the facility. When mobilization and construction of containment structures (4 weeks), duration of dredging (5 weeks) and restoration of the site (3 weeks) are factored in, the total time required to process 10,000 cy of material is approximately 12 weeks, or 3 months.

The projected volume of UDM from Gloucester Harbor in the first five year planning horizon is 159,695 cy. The theoretical 3.2 acre dewatering site could process the material for upland disposal/reuse in 87 weeks (159,695 cy X 5 weeks per 10,000 cy + 7 weeks mobilization/demobilization). The above numbers represent the best-case scenario; scheduling conflicts and weather delays will extend the processing time.

Seasonal dredging restrictions imposed to protect fish spawning would require dredging to be spread out over several years, given the limited throughput capability of a small dewatering site. Dredging in most areas is limited to the late fall and winter months, a 5-month (22-week) period. With one dewatering site, 3.2 acres in size, the maximum volume of dredging that can occur in any one dredging season is about 30,000 cy.

As part of the DMMP DEIR process of exploring potential dewatering site options, the screening process focused on a universe of potential sites within the municipal boundaries of Cape Ann communities from Rockport to Manchester. A total of 37 potential dewatering sites were identified in Cape Ann. The sites were identified by examining aerial photographs and via windshield surveys conducted in 1997 and 1999. Also, meetings were held with local municipal officials to aid in the process of identifying vacant, open or undeveloped waterfront site as a potential location for dewatering.

4.3.5 Upland Disposal/Reuse Disposal Alternatives

Upland reuse disposal alternatives involve the placement of UDM on land. The land site can be an existing active or inactive landfill, or a raw parcel of land. Dredged material can be used as daily cover or grading/shaping material for landfills, provided the material meets the physical and chemical specifications for such use. Dredged material placed on a raw parcel of land could be managed as a landfill, or could be used as a grading material that has some end use (e.g. ball fields, golf course, etc.), provided the physical and chemical properties of the dredged material permit such use. There are currently no comprehensive regulations in Massachusetts which specifically apply to the disposal of dredged material in the upland environment, although DEP has issued a series of Policies and Interim Management Requirements. In general, upland disposal is regulated under the Commonwealth's Solid Waste Management Regulations @ 310 CMR 16.00 and 19.000 (See DEP's July 8, 1999 Dredged Sediment Interim Management Requirements in Appendix B, Volume 1). Dredged material, when amended with other material such as Portland cement, could potentially be beneficially used, the current permitting procedure being a Benefial Use Determination under 310 CMR 19.060.

The cost for upland disposal ranges from $117 - $683/cy for silty UDM that is not suitable as final cover for landfills. Clayey sediments that could be used as final cover material would be slightly less expensive to dispose of in a landfill.

Table 4-1, provides a descriptive summary of all disposal alternatives considered for UDM for Gloucester Harbor.

Table 4-1: Disposal Types - General Summary Matrix

Disposal Type	Benefits	Drawbacks	Contaminant Pathways
CDF	Contaminated sediment sequestered from marine environment; creation of new land for port expansion, recreation, commerce, etc..	Permanent loss of subtidal and intertidal habitat; fine sediments may require extensive dewatering time, restricting use of the site for extended period.	Birds and small mammal can be temporarily exposed to contaminants in soil and potentially ingest contaminated organisms before cap placement.
CAD - In Channel	Contaminated sediment sequestered from marine environment; impact occurs within already disturbed area; relatively low cost	Technology of capping not perfected; limits potential future dredging depths; short-term water quality impacts; permanent change to bathymetry of disposal site	Suspended particulate matter released during disposal can affect water column
ATC-CAD	Contaminated sediment sequestered from marine environment; relatively low cost; close to channel dredging areas	Technology of capping not perfected; ATC areas may not be degraded, therefore high value bottom habitat can be impacted; short-term water quality impacts	Suspended particulate matter released during disposal can affect water column; potential change in substrate type.
CAD	Contaminated sediment sequestered from marine environment; relatively low cost;	Technology of capping not perfected; CAD areas may not be degraded, therefore bottom habitat can be impacted; short-term water quality impacts; large volume of capping material required to cover mound	Suspended particulate matter released during disposal can affect water column; potential change in substrate type.
TH	Creation of salt marsh or tidal flats beneficial to water quality and wildlife.	Contaminated sediments cannot be used for habitat creation because of potential bioaccumulation/biomagnification/bioturbation of contaminants.	Benthic organism and plants living in contaminated sediments can transfer pollutants within food web.
Upland	Removal of contaminants from marine environment into a well engineered and monitored situation.	Large dewatering area required; air quality, noise, traffic impacts; high cost; future use of disposal site permanently affected due to material placement and land use changes and restrictions.	Potential groundwater contamination from leachate; potential contaminated stormwater runoff; air quality impacts from fugitive dust and odor
Alternative Treatment Technology	Removal of contaminants rendering sediment potentially suitable for ocean disposal or beneficial reuse (tidal habitat creation)	Cost prohibitive, particularly for small projects. Residuals may require treatment. Potential air emissions.	Air and wastewater emissions from processes.

4.4 Disposal Site Screening Process

The disposal site screening process is designed to assess all possible alternatives through the sequential application of environmental, social and economic criteria. As sites with significant conflicts are removed from consideration, the assessment of remaining sites becomes more detailed. Ultimately, only those sites with minimal or no conflict with the criteria are subjected to intensive evaluation to determine which remaining sites best meet the goals of the Gloucester Harbor DMMP.
A universe of disposal sites was developed during Phases I and II of the DMMP, including sites recommended by the Gloucester Harbor Dredging Subcommittee. These were evaluated in a tiered process. The result of this process is the identification of a range of practicable and reasonable disposal site alternatives. These sites, determined through the evaluation process described below, are evaluated in detail in this DEIR.

The types of disposal sites and methods identified through this process include: Adjacent to Channel (ATC), Channel Over Dredging, Confined Aquatic Disposal (CAD), Capping (CAP), Confined Disposal Facility (CDF) for land creation, Tidal Habitat Creation (mudflat or marsh), upland (reuse or disposal), and alternative treatment technologies.

The disposal site screening criteria described in this DEIR were developed independently, based on published federal and Massachusetts disposal siting criteria and conforming with the Providence River and Harbor Maintenance Dredging Project Draft Environmental Impact Statement (USACE, 1998). The evaluation factors used in the Providence River DEIS were reviewed by the USEPA, USFWS, NMFS and Massachusetts regulatory agencies to obtain their concurrence with the criteria that would be the basis for disposal site decisions. The evaluation factors were also reviewed by the Gloucester Harbor Dredging Subcommittee.

The disposal site screening process includes four categories of evaluation criteria: criteria for all sites, criteria for aquatic disposal sites, criteria for upland disposal sites, and criteria for beneficial reuses. The process of site screening is generically illustrated in Figure 4-7. Each disposal alternative category listed above underwent this screening analysis, with some variation during one or more stages of the process to account for the unique issues associated with each type of alternative. The site screening process for these categories is described in Sections 4.5 through 4.8.

The screening criteria were applied in sequential phases to each of the two major disposal site option groups (i.e., upland and aquatic). The first phase of the screening process ("Feasibility Screen") was to eliminate sites that are clearly a poor choice for disposal of dredged material because of one or more of the following: the surrounding land uses (for upland sites), their inaccessibility relative to the type of disposal proposed, their inability to contain a sufficient volume of material. Sites that are not feasible disposal options are permanently eliminated from further consideration under the DMMP.

In order to facilitate involvement with the City and the Gloucester Harbor Dredging Subcommittee, and to provide a concise framework for evaluation and comparison of each disposal site, data sheets were developed which provided information from each site relative to the evaluation criteria. These data sheets were reviewed with the Subcommittee during various phases of the screening process. Maps depicted the location of these sites and summary comparison matrices were also disseminated with the data sheets.

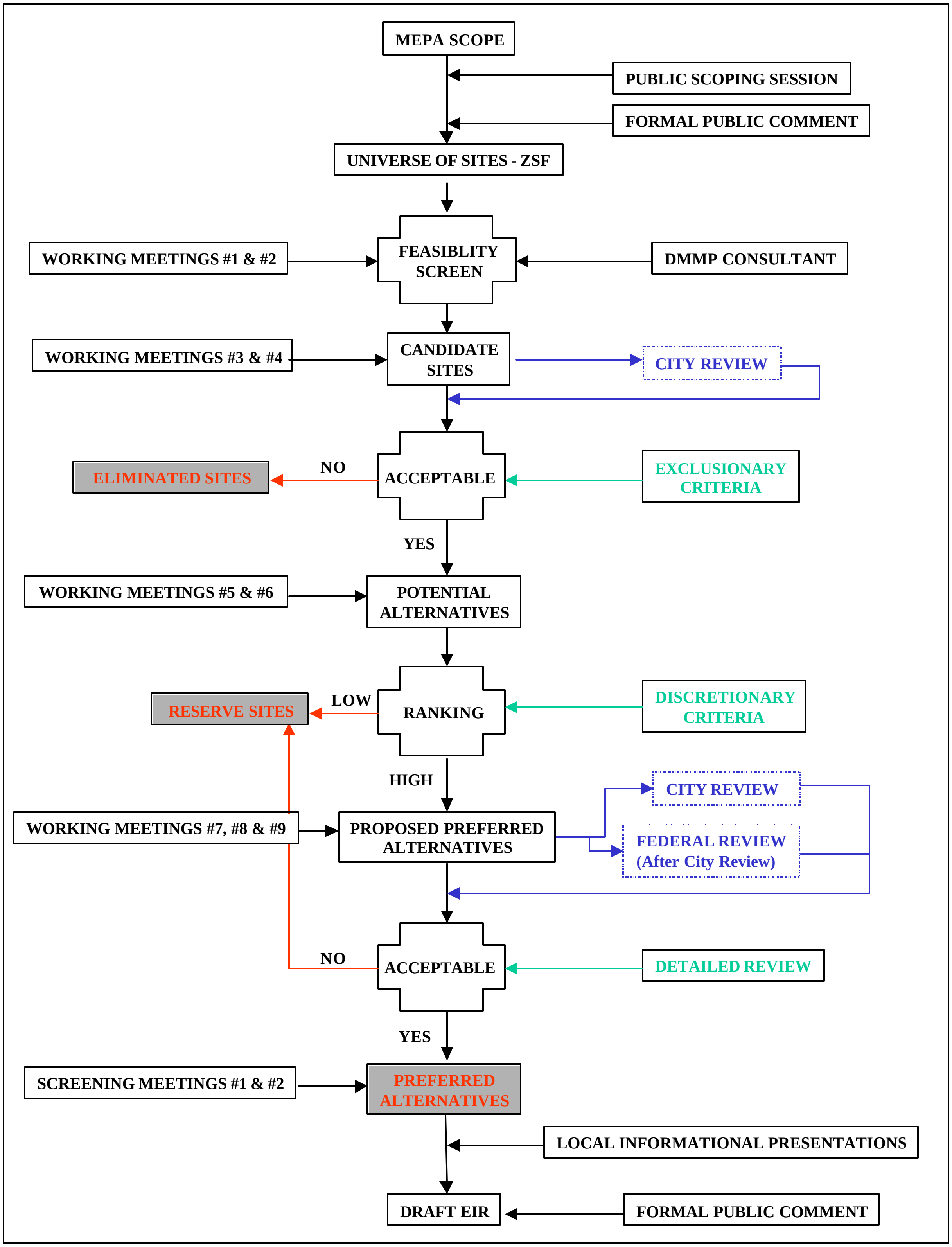


Figure 4-7: DMMP Disposal Site Screening Process

Sites that survived the feasibility screen, i.e. candidate sites, in addition to be being presented to the City and the Harbor Plan Dredging Subcommittee, underwent exclusionary criteria analysis. For example, sites that were located in areas inhabited by federally or state-designated endangered species were eliminated from further consideration. In some cases, such as for the upland disposal analysis, exclusionary criteria significantly reduced the number of sites for further study. In other cases, such as for the aquatic disposal analysis, exclusionary criteria had no effect on the screening process. Where it was deemed useful and practicable, such as with the candidate aquatic sites, site-specific field investigation was conducted to better characterize and distinguish the sites. Those sites that survived this screen were deemed potential alternatives.

A series of discretionary criteria were applied to each of the potential alternatives. Each potential site was evaluated with respect to these criteria and the result was a ranking of sites. At this stage in the process, each of the sites had potential as a dredged material disposal site but some sites had attributes that clearly distinguished them from the other sites. These "higher ranking" sites were then elevated to "proposed preferred" status. These sites, and the process whereby they were selected, were presented to the City and federal resource agencies for review. These sites also underwent more detailed field analysis and the result was the selection of a preferred alternative, which is the alternative that is evaluated for environmental consequences in Section 6.0 of this DEIR.

The following sections of this DEIR are divided to correspond with the four categories of disposal alternatives considered for the Gloucester Harbor DMMP. Sections 4.5 through 4.8, describe the procedures, screening criteria and results of alternative treatment technology, dewatering, upland and aquatic disposal siting analyses.